

# SIGMA XI QUARTERLY

Vol. XIII

MARCH, 1925

No. 1



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Secretary.....	EDWARD ELLERY Union College, Schenectady, N. Y.
Treasurer.....	GEORGE B. PEGRAM Columbia University, New York City

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CLARENCE E. MCCLUNG.....	University of Pennsylvania, Philadelphia, Pa. <i>Term expires January, 1927</i>
VERNON KELLOGG.....	National Research Council, Washington, D. C. <i>Term expires January, 1928</i>
HENRY B. WARD.....	University of Illinois, Ill. <i>Term expires January, 1929</i>
WILLIAM F. DURAND.....	Stanford University, California <i>Term expires January, 1930</i>
C. E. DAVIES.....	New York, Alumni Representative <i>Term expires January, 1930</i>

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FREDERICK B. UTLEY.....	Yale '03, Pittsburgh, Pa.
DAVID STARR JORDAN.....	Cornell '87, Stanford University
THOMAS W. BARRALLY.....	Union '87, Tonawanda, N. Y.
PAUL B. MAGNUSON.....	Penn. '08, Chicago

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Gift  
Prof. C. C. Case  
5-19-29

# SIGMA XI QUARTERLY

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## EDITORIAL COMMITTEE

FLOYD KARKER RICHTMYER  
EDWIN EMMY SLOSSON

HENRY BALDWIN WARD  
EDWARD ELLERY

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## EDITORIAL NOTES AND COMMENTS

The contents of this number are calculated to interest both members of active chapters and alumni. We present the records of the December meeting of the Executive Committee and of the Annual Convention. In connection with the latter, what cannot be presented is the spirit of the gathering as displayed by the speeches of the delegates on the floor of the convention, the spontaneous expression of interest in the welfare of the organization, of appreciation of the difficulties with which the national officers are confronted in the increasing and present demands made by the continued growth of the society, and of assurance that the chapter membership would vote financial and spiritual support in meeting these imperative demands. This was all most gratifying. From their intimate knowledge of the affairs of the society, the demands made upon it and the possibilities inherent in it, the national officers are convinced that the society can no longer be conducted upon the limited scheme of the past twenty-five years. To stop where we are means deterioration and final disintegration. The society must move forward. It has an important and unique function to perform. The delegates to the convention, and through them the chapter membership, are convinced of this. These assurances of confidence and of willingness to help are the basis upon which the Executive Committee will formulate plans for the future.

\* \* \* \* \*

This number also contains Dr. Russell's address on the occasion of the Third Annual Sigma Xi Lecture given under the joint auspices of our society and the American Association for the Advancement of Science. It is interesting reading. It sets forth another of the

triumphs of science applied for the benefit of the race by intelligent minds.

\* \* \* \* \*

Attention is particularly called to the statement regarding the Alumni Fund, the personnel of the committee appointed to administer the fund and the principles upon which the committee is agreed the fund should be expended. The Alumni Fund assumes proportions of which all Sigma Xi members can be rightfully proud. Not only does the number of contributors increase, but the number of those who desire constant contact with the society through the official publication increases in gratifying degree. The Executive Committee confidently expects that the next five years will see the organization firmly and definitely entrenched in a dignified and worthy position among the scientific organizations which are helpful in advancing the United States to the place it ought to occupy in the progress of science. A very small investment of two dollars a year brings large returns which certainly cannot be duplicated among any other human interests.

\* \* \* \* \*

We are glad to announce the re-election, as a member of the Alumni Committee, of Mr. Clarence E. Davies of New York City. Since his first election two years ago, Mr. Davies has been invaluable in pushing Sigma Xi interests among the alumni. He is full of ideas, has a large supply of energy which he applies intelligently, and co-operates heartily with the members of the Executive Committee in the plans they are making for the onward movement of the society. It was Mr. Davies who conceived the idea of the New York meeting of Sigma Xi alumni which proved such a brilliant success. He is now at work upon a scheme of extending such meetings to other large centers. By a vote of the Alumni Committee taken by mail, Mr. Davies was re-elected chairman of the committee for the ensuing year.

\* \* \* \* \*

The society is to be congratulated upon the election by the Convention of Dr. William F. Durand as a member of the Executive Committee. He brings to the work of the society a broad and rich experience and is sure to render invaluable aid in the great work which the society is bound to do in the next five years.

## MINUTES OF THE EXECUTIVE COMMITTEE MEETING

WASHINGTON, DECEMBER 28, 1924

A meeting of the Executive Committee was held in Washington, December 28, 1924. Present were:—President Richtmyer, Dean Ellery, Dean Pegram, Professor Stewart, Doctor Kellogg, Professor Ward and Mr. Davies.

Professor Ward reported that he was still in possession of a part of the "revolving fund" of the secretary's office. The committee voted that the sum be transferred to the national treasury.

The president reported that in accordance with the terms of the constitution, he had appointed a nominating committee to name a candidate for membership in the Executive Committee to succeed Dean Eigenmann, whose term of office expired and a candidate for membership on the Alumni Committee to succeed Mr. C. E. Davies whose term of office also expired. The committee consisted of President Howe of Case School and Dr. Musselman of Johns Hopkins.

President Richtmyer appointed Professors Quimby and Webb of Columbia to act as auditing committee.

The sub-committee appointed at the Cincinnati meeting to prepare and present a plan for the administration of the Alumni Fund reported as follows:

"Your committee appointed to formulate plans for the administration of funds contributed by alumni for fellowships or for other means of promoting and supporting research, submits the following statement of its recommendations:

1. A Fellowship Committee shall be appointed by the Executive Committee and shall consist of three members of the society, each serving for three years, one member to retire each year. (These members shall be selected for their ability to administer and guide research work.)

2. At its meeting held in conjunction with the Annual Convention of Sigma Xi, the Executive Committee shall, on recommendation of the Fellowship Committee, make an allotment for the following year from the Alumni Fund for the administration of fellowships or for other means of supporting research.

3. The allotment shall be administered by the Fellowship Committee, at its discretion, to maintain fellowships or support research. The allotment shall be kept by the treasurer who will make payments from it on vouchers of the Fellowship Committee.

4. The Fellowship Committee shall present an annual report to the Executive Committee which will be published in the Sigma Xi Quarterly and which

will state the fellowships awarded or research support granted and the research results obtained.

In support of these recommendations the committee wishes to state that it believes the Fellowship Committee should not be hampered by restrictions or rules. The committee should be free to select projects and spend the allotment with the sole idea of securing results in any field of science by stimulating research personnel or by conducting investigations for definite ends. The field is so broad, there are so many research-supporting agencies and the opportunities for giving assistance are so varied that to promote research properly the committee should be given full authority to study the problem and administer the allotment in accord with its best judgment.

The committee recommends that the allotment be made from the Alumni Fund which is established by the constitution because it believes that as a general policy it is best to approach the alumni members of Sigma Xi for only one contribution each year. These contributions will go into the Alumni Fund and be distributed by the Executive Committee. The matter of alumni dues or contributions is, however, being considered by another committee."

(Signed) GEORGE B. PEGRAM

G. W. STEWART

C. E. DAVIES, *Chairman.*

The Executive Committee accepted and approved the report.

In accordance with the terms of the report of the Committee on the Alumni Fund, the Executive Committee referred to President Richtmyer the power to appoint a Fellowship Committee. Later, the president appointed the following: Dr. W. R. Whitney, Director of the Research Laboratory of the General Electric Company, Professor E. L. Thorndike of Columbia University, Dr. John H. Northrup of the Rockefeller Institute for Medical Research.

The Budget Committee, consisting of the treasurer and the secretary, reported a budget for 1925 as follows:

*December 28*

QUARTERLY.....	\$ 800.00
Secretary's office expenses (including clerical hire)...	1500.00
President's office expenses.....	100.00
Traveling expenses of Executive Committee (spring meeting).....	450.00
Engrossing charters.....	120.00
Traveling expenses of officers.....	400.00
	<hr/>
	\$3370.00

The sub-committee appointed at the Ann Arbor meeting, consisting of Deans Ellery and Pegram, to consider a revision of the procedure for installation of new chapters reported as follows:

## MINUTES OF EXECUTIVE COMMITTEE MEETING 5

"The committee appointed at the meeting in May, 1924 to consider a revision of the procedure for installation of new chapters submits the following report and resolution: Your committee is of the opinion that the present practice of having the installation of each new chapter carried out by the president of the society in person and by the secretary should be continued. Further, that, whereas the new chapter has heretofore had to arrange to meet the traveling expenses of the president and secretary to the installation and has thus carried a burden dependent on its geographical position, it is the opinion of your committee that the Society of the Sigma Xi is now so well established as a national, and even international, society that geographical situation should no longer determine the expense to a new chapter of its installation. We have considered the desirability of a uniform installation fee to be charged each new chapter, but in view of the fact that we now have the initiation fee coming in from each new member, it is our opinion that the society should bear the traveling expenses of the president and the secretary to the installation of a new chapter, wherever located."

"The adoption of the following resolution is recommended:

*Resolved*, That the Executive Committee authorize the payment of the traveling expenses of the officer or officers of the society to the installation of each new chapter of the society."

The committee voted to accept and approve the report.

The committee voted further that the national society should pay the expenses of the officer of the society appointed by the president to make a preliminary survey of the conditions at any institution from which a group of faculty members were contemplating making a petition for a charter.

It was further voted to ask the national officers to prepare a form of report which such visiting officer should make for the use of the Executive Committee.

It was voted to continue the sub-committee on the revision and codification of definite procedure for petitioning groups.

It was voted to continue the sub-committee on the Quarterly.

It was voted to continue the sub-committee on conventions.

It was voted that the spring meeting of the committee be held in New York at a date to be determined later. (Since the meeting of the committee the date has been set for May 2 and 3.)

It was voted to name the chapter at Pasadena—The California Institute of Technology Chapter.

It was voted to ask Mr. Davies to investigate the advantages of incorporating the society and to make a report of his findings at the May meeting.

It was voted to ask Dr. Kellogg to report at the spring meeting suggestions regarding coördination of the possibilities of the society.

It was voted to authorize the Fellowship Committee to expend a sum not exceeding two thousand dollars from the Alumni Fund in aid of research during 1925-26, and it was further voted that the secretary be authorized to expend a sum not exceeding four hundred dollars to secure further contributions to the Alumni Fund.

The president reported inquiries regarding charters from groups at a number of institutions. Careful consideration was given each inquiry. Definite action was taken as follows:

*University of Cincinnati.* The committee appointed President Richtmyer as an official visitor to the institution to report at the spring meeting.

*Lehigh University.* It was voted to encourage the possible petitioners to form a Sigma Xi club.

*University of South Dakota.* It was voted to encourage the group of possible petitioners to form a Sigma Xi club.

*University of Maryland.* Dr. Kellogg was appointed an official visitor to make a report at the spring meeting.

A formal printed petition from a group at New York University was presented and given careful consideration. Action was deferred until the spring meeting.

The committee expressed itself as favoring in principle the election of women members to the Alumni Committee.

EDWARD ELLERY, *Secretary.*

## PROCEEDINGS OF THE TWENTY-FIFTH CONVENTION OF THE SIGMA XI

WASHINGTON, D. C., DECEMBER 30, 1924

The Twenty-fifth Convention of the Society of the Sigma Xi was held in Corcoran Hall, George Washington University, Tuesday, December 30, 1924.

The business session convened at half past two in the afternoon with President Richtmyer in the chair. The following were appointed a committee on credentials: Professor Harley E. Howe, Cornell; Professor Gellert Alleman, Swarthmore; Professor Harry A. Curtis, Yale. The committee received the credentials of the delegates and, after inspecting the papers, reported as follows:

Cornell.....	H. E. Howe
Rensselaer.....	R. A. Patterson
Union.....	J. H. Stoller
	Edward Ellery
Kansas.....	W. S. Hunter
	N. P. Sherwood
Yale.....	Harry A. Curtis
Nebraska.....	Robert H. Wolcott
Pennsylvania.....	C. E. McClung
Iowa.....	C. H. Farr
Columbia.....	George B. Pegram
Chicago.....	H. S. Everett
Illinois.....	Henry B. Ward
	H. J. Van Cleave
	E. Roberts
Missouri.....	Miss Robinson
Syracuse.....	V. Obreshkove
University of Washington.....	August Dvorak
Purdue.....	C. A. Parten
Texas.....	B. C. Tharp
	H. V. Atkinson
Mayo Foundation.....	T. B. Magath
North Dakota.....	L. P. Dove
Kentucky.....	M. N. States
	W. D. Funkhouser
Swarthmore.....	Gellert Alleman
Oregon.....	H. B. Torrey
Virginia.....	S. A. Mitchell
Johns Hopkins.....	J. R. Musselman
Oklahoma Sigma Xi Club.....	H. L. Dodge

Sigma Xi Club of Southern California.....Mr. Weatherby  
 Carleton College Sigma Xi Club.....E. A. Fath  
 Sigma Xi Club of Mich. Agr. College.....R. C. Huston  
 Sigma Xi Club of the Univ. of Pittsburgh..O. Blockwood

There were thus twenty-eight out of fifty-two chapters and clubs represented.

The following officers and members of the Executive Committee were present:

*President*.....F. K. RICHTMYER (Cornell)  
*Secretary*.....EDWARD ELLERY (Union)  
*Treasurer*.....GEORGE B. PEGRAM (Columbia)  
*Executive Committee*....GEORGE W. STEWART (Iowa)  
                                   CLARENCE E. MCCLUNG (Pennsylvania)  
                                   HENRY B. WARD (Illinois)  
                                   VERNON KELLOGG (Washington)  
                                   CLARENCE E. DAVIES (New York, Alumni Rep.)

The proceedings of the 1923 Convention held in Cincinnati were approved as printed in the *QUARTERLY* for March, 1924. The president reported for the Executive Committee as follows:

The Executive Committee reaffirms its position taken in 1918, that the extension of the society to institutions outside the United States is desirable and regards as particularly important the extension of the society to Canadian institutions.

The committee has voted its approval of the principle that when the right time comes, the official journal should be expanded into a journal attractive to the alumni and open to subscription from alumni and members without materially changing the present policy of the *QUARTERLY*.

The committee has voted to approve in principle the formation of alumni centers and Mr. Davies, Alumni Representative, at the request of the committee has investigated the possibility of organizing the alumni of New York City.

(An account of the meeting of the New York Alumni appeared in the December *QUARTERLY*.)

The committee has approved the appointment of a Fellowship Committee of three to receive and act upon applications for fellowships.

(The membership of this committee is announced on page 37.)

The committee voted that for the academic year 1925-26 the Fellowship Committee be authorized to expend a sum not exceeding \$2000 in support of research.

Attention was called to the fact that the society acts jointly with the American Association for the Advancement of Science in presenting a program for the second general meeting of the convention of the association. This is the third year of the arrangement. The first year Dr. Farrand, President of Cornell, gave the address; the second year Dr. Whitney, Director of the Research Laboratory of the General Electric Company, gave the address; and the address for the year 1924 will be delivered by Dr. Frederick F. Russell, Director of the International Health Board of the Rockefeller Foundation.

Announcement was made of the installation of the chapter at the California Institute of Technology to take place February 5, the president being the installing officer and arranging for visits to various chapters and clubs en route.

Inquiries have been received from groups at eleven institutions regarding the possibility of a charter. In the case of two of the eleven, it seemed to the committee the situation warranted the appointment of an official visitor to make personal survey, hold conference with the faculty and administration and to make reports to the Executive Committee at the spring meeting.

There are forty-two chapters and ten Sigma Xi clubs. The organization is growing so rapidly, and the consequent additions to the work of the secretary's office are so great, as to make entirely inadequate the present secretarial arrangements. The society must have in the very near future a paid secretary if the work of the organization is to be at all effective.

Effort has been made to correct the addresses of alumni of the various chapters. To date, through the secretary's office and the assistance of chapter secretaries and alumni recorders, the address lists of twenty-seven chapters have been brought as nearly up-to-date as was possible.

Under the existing conditions, it is possible for any individual anywhere to secure from any jeweler a Sigma Xi key, since the society has no authorized jeweler and no uniform method of issuing keys. The question has been raised as to whether the time has not come for the society to appoint an authorized jeweler and to legislate that keys shall be issued only through an official order from the national secretary, just as associate emblems are now issued.

The national secretary reported as follows:

Dean Pegram presented the report of the treasurer which appears on page 33.

The president announced that reports of chapters are printed in the official journal as space permits. Brief reports were called for from any delegates from Sigma Xi clubs who were present at the convention. The following clubs responded: Oklahoma, Southern California, Carleton College, Michigan Agricultural College and University of Pittsburgh.

Mr. Davies, Alumni Representative on the Executive Committee, made a report which appears on page 40 of this issue.

Dean Pegram moved that the annual assessment of seventy-five cents per member be levied upon the chapters. The motion was unanimously passed.

It was further moved that the Executive Committee be asked to consider an increase in the annual assessment and make a report at the 1925 convention.

Professor Musselman of the nominating committee made a report as follows: for member of the Executive Committee to succeed Dean Eigenmann, whose term of office expires with this convention,

Dr. William F. Durand of Leland Stanford, President of the American Society of Mechanical Engineers; as a member of the Alumni Committee to succeed himself, Mr. C. E. Davies, Rensselaer 1914.

(By a later canvass of the Alumni Committee, taken by mail, Mr. Davies was named as chairman of the Alumni Committee for 1925.)

Announcement was made of the annual dinner to be held at the Interior Department Cafeteria on F Street and of the annual Sigma Xi lecture to be held at Memorial Continental Hall. The meeting adjourned.

#### THE CONVENTION DINNER

Delegates and guests to the number of 155 reconvened at half past six at the Interior Department Cafeteria for the annual dinner. Arrangements for the dinner, which had been made through the chairman of the local committee, Dr. W. E. Tisdale of the National Research Council, were admirably carried out in spite of the fact that the number present was greatly in excess of the number the cafeteria management had been able to provide for. At the close of the dinner addresses were made by Dr. Frederick F. Russell and Senator Joseph E. Ransdell of Louisiana. The former expressed his appreciation of the privilege of meeting with the society and his interest in its aims and work. The latter spoke enthusiastically of his associations with scientists throughout his more than two score years in the United States Congress and told in entertaining manner of his connection with the work of exterminating yellow fever and the cattle tick in Louisiana and Texas. This was the first time in the history of the society that the society had as its dinner guest a member of the United States Senate. The members of the society present expressed in unmistakable manner their appreciation of the effort that Senator Ransdell had made to be present and speak.

A hearty vote of thanks was given to Dr. Tisdale for his labors as chairman of the local committee of arrangements in connection with the convention and the dinner.

#### ANNUAL LECTURE

The third annual Sigma Xi lecture given under the auspices of the society and the American Association for the Advancement of Science was delivered by Dr. Frederick F. Russell, Director of the International Health Board. Dr. Russell's address follows.

## WAR ON DISEASE, PARTICULARLY YELLOW FEVER AND MALARIA

An Address by DR. RUSSELL

Hygiene is one of the oldest words in the language, yet modern hygiene is one of the youngest and newest of the sciences, even now rapidly growing and many of its details not yet firmly established. As a substitute for knowledge, in matters of hygiene, we have had in the past a great many traditions, some so old and firmly fixed that they might well be called the folklore of hygiene. The more ignorant and backward the population, the more firmly fixed it is in its superstitions, particularly in rules for daily life, what foods may be eaten, and what combinations of food are poisonous; what baneful results may follow sleeping in the open, especially in the moonlight, and a thousand other erroneous beliefs.

The new hygiene is gradually furnishing real and substantial knowledge based on accurate observations to light the dark places of our ignorance. Scarcely any new discovery meets with more opposition and incredulity from the general public than advances in hygiene which affect our daily life. All here, I think, would be prepared to acknowledge the truth of the statement that a good milk supply in ample quantity is highly desirable, if not absolutely necessary, for children; yet even this is not accepted by backward peoples. In fact, they place themselves in open opposition to such a doctrine, declaring that milk is poisonous for babies and that it breeds worms. This is merely an example of the many difficulties that public health officials encounter in attempting to educate the public. No single pupil, of course, could ever be so difficult as an uneducated country-side. The difficulties encountered, however, only sharpen one's enthusiasm for overcoming them, and the obstacles are gradually being overcome. The people respond slowly but surely in a satisfactory way if one be content with moderate progress.

The steady improvement in the standard of living, with its better housing, environment, and more carefully inspected food supplies, all raise the level of the hygienic conscience without conscious effort on the part of the individual. Public Health does not always receive credit for these general measures which come with improved

living conditions and greater prosperity, yet in a broad sense these improvements are due to the effect of better knowledge of hygiene, on builders and on governments. An adequate water supply is not installed merely for purposes of fire protection but in deference to the sanitary sense of the officials and of the community. One has merely to glance over the advertisements in current periodicals to realize the appeal which health and sanitation make to the pocket book of the public.

What is it that has brought new light into hygiene and public health? It is increase in our knowledge of medicine and the related sciences; and as regards hygiene the related sciences are many. Progress in physiology has been most helpful and we now understand better the nature and importance of fatigue to the individual in industry; biochemistry has taught us many new facts, particularly the value of balanced rations and vitamins in the diet. The study of nutrition of children is now developed sufficiently for a child welfare program to be based on sound scientific principles. Correction of undernourishment in children, be they rich or poor, has a far reaching effect, since the child is improved in all respects and not merely in weight; and care of the growing child will give not only a healthier but a longer life. The many defects found in students in Europe to-day are directly related to the privation suffered during the war.

Another of the collateral sciences upon whose progress public health is dependent to an extraordinary degree is entomology. Although insects had been suspected of carrying disease all through the ages, definite proof was lacking until modern times. The first complete and successful study was that made by Theobald Smith in 1899 in his studies of Texas cattle fever. The inciting agent of this disease is a protozoön, or single celled animalcule, called the *Babesia bigeminum*, and it is conveyed from animal to animal by young ticks. The young or seed tick needs blood for its growth, and after hatching on the ground climbs up the shrubbery or blades of forage grass, and waits until some warm-blooded animal passes within reach. It then transfers itself to the animal host, feeds to repletion, molts, and feeds again and repeats the cycle until it reaches the adult stage. The engorged female, full of infected blood from her host, drops to the ground, deposits her eggs and dies. The young are soon hatched, and in this disease, being already infected in the egg stage, immediately inoculate their new victim with the virus, and so the cycle is completed. For this disease there is no cure;

prevention, on the other hand, became feasible when the life history of the tick was understood. It takes a fairly long time, even in the tropics, for the seed tick to reach maturity, about three weeks, so that a successful program was elaborated to free pastures from ticks, by killing each successive brood before it reached the egg-laying age. Cattle act as bait in gathering the ticks from pastures and the ticks are then killed *en masse* by immersing the cattle for a moment in great tanks filled with a dilute solution of arsenic. No better example is needed to prove the adage that in medicine at least, prevention is better (and easier) than cure. It was fortunate, indeed, that Theobald Smith solved so completely the life histories of the parasite and its carrier, and so established beyond all doubt the importance of the insect in disease transmission. Veterinary medicine has contributed much, directly and indirectly to hygiene, and gives us principles and facts of inestimable value in protecting the life and health of human beings.

Yellow fever is another disease which is insect-borne, and of special interest to us, because it is peculiarly American; to be sure the disease exists along the Gulf of Guinea on the west coast of Africa, but that fact had been overlooked until 1910 when it was described by Sir Rupert Boyce of the Liverpool School of Tropical Medicine, and others, but we shall speak of that later.

For all practical purposes, yellow fever has been an American disease, whose origin is, as yet, unknown. It has never been observed in the Far East, nor even in Europe, except during small outbreaks in harbors due to the presence of cases on ships. It always died out promptly and has never taken root anywhere in Europe.

Just when it was first observed in America, it is difficult to say. In the chronicles of early Spanish exploration and colonization it is not referred to, and the histories are of such excellence that the failure to mention or describe the disease is significant as to its absence. No disease resembling yellow fever was encountered by Cortez and his followers in Mexico or Cuba. Aztec histories in picture writing exist for the period preceding and following the conquest, and they are also silent.

It was in 1648, one hundred and fifty years after the discovery of America, that the first recognized epidemic occurred in Yucatan, and the islands of Martinique and Guadeloupe and St. Kitts. It is uncertain whence it came; further study is necessary to solve the

mystery. Two sources of information remain to be studied; first, the records of the Indian tribes of Central and South America, many of the tribes having a high degree of civilization; and second, the nature and distribution of the disease in West Africa, together with such records as are available there. Studies already planned, it is hoped will clear up these doubtful points.

From Yucatan and the French islands the fever spread to the entire West Indies and to the mainland all round the Gulf of Mexico and the Caribbean Sea. It secured a precarious foothold in the southern states and spread in frightful epidemics to the north from time to time during the summer heat.

In the last years of the 18th century (1793), it appeared in Philadelphia, and between the first of August and the middle of September 4041 persons, approximately one-tenth of the total population, died of it. "The consternation of the people," wrote Mathew Carey, and eye witness, "was carried beyond all bounds. Dismay and affright were visible in the countenance of almost every person. Many shut themselves in their houses and were afraid to walk the streets. . . . .

"Acquaintances and friends avoided each other, and only signified their regard by a cold nod. The old custom of shaking hands fell into such disuse that many shrank back with affright at even the offer of the hand. A person with crepe, or any appearance of mourning was shunned like a viper, and many valued themselves highly on the skill and address with which they got to the windward of every person they met. Indeed, it is not probable that London, at the last stage of the plague, excited stronger marks of terror than were to be seen in Philadelphia from the 24th or 25th of August until pretty late in September" of 1793.

Such scenes were not unknown in other northern cities, Boston, New York, and Baltimore, and in fact all the seaports of the Atlantic Coast, and settlements in the Mississippi Valley were visited from time to time by the yellow plague. No doubt some of those present this evening may remember the great epidemic in Memphis in 1878 when there were 17,600 cases with 5150 deaths. The disease was not confined to Memphis but occurred extensively through the southern states as far north as Virginia. The money loss to the states affected by this epidemic is estimated at \$100,000,000. During the first three-quarters of the nineteenth century, the disease appeared every year, with two exceptions, somewhere in the United States.

During the past two hundred years, the records show 95 distinct invasions of the United States. It is impossible to give the number of cases and deaths, but it is estimated that not less than 100,000 persons died. New Orleans suffered more than any other place, having had 41,348 deaths. Ten thousand and thirty-eight died in Philadelphia. It is probable that not fewer than 1,000,000 cases have occurred within our territory. It always disappeared in the United States with the advent of autumn and the first frost, but in the tropics to the south of us where frosts are unknown, there was no pause and an epidemic might continue for years. Indeed, the disease was never entirely absent from the shores of the Caribbean. In certain centers of population, such as Vera Cruz and Havana, it was constantly present, that is, endemic, and these foci sufficed to keep the infection alive in all the surrounding susceptible territory. It traveled both north and south, from port to port, from its home along the shores of the Caribbean sea, to the northern cities of the United States and to the southern ports of Brazil. It crossed the Isthmus of Panama and traveled up and down the west coast of North and South America.

So much for the early history of the disease.

As to the manner of its spread, many theories were held; it did not behave like the other contagious diseases; it obeyed none of the rules. Multiple cases in houses occurred, yet were the exception. New cases did not ordinarily arise in hospitals. Explanation of its spread by contact was impossible, and in default of a better theory it was believed that the germs were preserved in clothing, bedding and furniture, or even about certain houses or ships. This was the doctrine of the infectious fomites. It was considered dangerous to handle clothing which had been worn by the sick. Even ballast in ships was considered a source of infection. As a result, an elaborate system of disinfection was built up, and ships in addition to being detained in quarantine for the full incubation period, were not permitted to land baggage or cargo until they had been fumigated with sulphur or disinfected with formalin or bichloride. On land the shot-gun quarantine was the rule, and all travel and commerce with the infected area was prohibited. The terror inspired by yellow fever was so great that the economic loss due to suspension of travel and trade was out of proportion to the loss of life.

Announcements were made from time to time that the cause of the disease had been discovered. Freire of Rio de Janeiro, Carmona de

Valle of Mexico, Finlay of Havana, Sanarelli of Italy and others made announcements. It was Sternberg, later Surgeon General of the Army who disposed of most of these claims. Sternberg, besides being the pioneer American bacteriologist, had a first hand knowledge of yellow fever, gained from personal experience in army posts along the Gulf Coast, and for this reason he was directed at various times by the War Department and the short-lived National Board of Health to study the disease both in the South and in Havana. He reviewed the work of all these investigators except that of Sanarelli, and showed the inadequacy of the proofs. Sanarelli's reputed discovery was disposed of by Reed and Carroll. Sternberg was the first American of distinction to study yellow fever with laboratory methods, and he deserves great credit for clearing the stage for the work of Walter Reed and his associates.

Many of you no doubt remember the situation in Cuba at the conclusion of the Spanish War. We had an army there, provided as liberally as possible with every necessity and yet the sick and death rates were extremely high. In the short period from July, 1898, to December, 1920, there occurred in our small army 1575 cases and 231 deaths from yellow fever, and this in spite of the fact that every measure known to sanitary science at the time had been used.

It was then generally believed that yellow fever was a filth disease and that it could not spread in a city clean in the sanitary sense. In Havana, however, experience soon proved this false, for in the cleanest and newest part of the city the rates were the highest.

It was at this time, early in 1900, that the army sent Major Walter Reed from Washington to Havana as the chairman of a board consisting of Carroll, Lazear and Agramonte to investigate the epidemic. At first they limited their study to bacteriological and pathological examinations, but after a short time Major Reed changed his plans radically and began the study of possible insect transmission. Doctor Carlos Finlay of Havana for twenty years had maintained such a hypothesis. He even went so far as to suggest the possibility of conferring immunity on non-immune individuals by causing them to be bitten by mosquitoes which had previously fed on yellow fever patients, but he did not succeed in demonstrating the truth of this hypothesis to the satisfaction of scientists, and it remained merely an interesting opinion which was without effect on the prevalence of the disease. It was probably the work of Doctor Henry R. Carter of the United States Public Health Service rather than of Finlay

which induced Reed to change his plans. Carter showed in 1898 that there was regularly a period of two to three weeks between the first and subsequent cases in each outbreak. Not until after this period did visitors to the house of a yellow fever patient run any risk of infection. This definite succession of events suggested the possibility of an insect host, because the facts resembled the conditions known to exist in malaria, where the parasite lives part of its complicated life cycle in the body of a mosquito. Reed resolved to investigate this possibility.

He planned his experiments before leaving Washington, and his program is noteworthy in that it included enough of the right kind of experiments to answer definitely the important queries, and contained none which were not essential. As an example of a proper *Frage stellung*, it can serve as an example for all time.

He established in Cuba a camp outside the infected zone far from all habitations, where there was no possibility of contracting the disease accidentally. He kept the entire personnel, none of whom had had the disease, in strict quarantine for several weeks before beginning work. This gave him a clean start. He erected two small wooden buildings, 20 by 14 feet, and screened both doors and windows carefully. One building was poorly lighted and ventilated and was called the infected clothing building. The second was well lighted and ventilated, and was divided into two equal parts by a wire screen partition. This was called the infected mosquito building. In the first building, he placed three men, and a quantity of the dreaded fomites consisting of the clothing, bed and body linen of patients who had recently died of the disease in Havana hospitals. These three non-immune volunteers unpacked the supposedly dangerous clothing every night and packed it up again in the morning; they even slept in dead men's clothing and in bedding used by fatal cases, and continued this nerve racking test for twenty days before the experiment was concluded and they were released. By this single crucial experiment, Reed discredited the doctrine of fomites which had been accepted by the world for scores of years.

At the same time in the other building, he prepared for his infected mosquito experiment. In one of the rooms was liberated on the eventful day five mosquitoes of the species now known as *Aedes aegypti* but which were then called *Culex fasciata* and later *Stegomyia fasciata*. Two of these had bitten yellow fever cases fifteen days before, one nineteen days and two twenty-two days. A young

American soldier, named John R. Kissinger, entered the room and lay down quietly on the bed and permitted these mosquitoes to bite him. On the other side of the screen, where there were no mosquitoes, were two other American soldiers to act as controls. The men were subsequently kept in quarantine and under close observation, and three and a half days after exposure Kissinger came down with a typical attack of yellow fever, the controls remaining well. Kissinger was carefully nursed from the beginning and his attack while typical was not of a severe type, and after a short illness he was restored to his former good health. The precautions taken by Reed were so complete that any other source of infection than the mosquito was absolutely excluded. The man was examined during his illness by the most celebrated diagnosticians in Havana and the disease was pronounced true yellow fever. Reed's problem was solved. He had succeeded under controlled conditions in transmitting yellow fever by the bite of a mosquito, and this fact was accepted by the most critical. Nevertheless, many details remained to be worked out, and in the next few months of the year 1900 he solved most of the mysteries of this hitherto baffling malady.

He next showed by another method that the virus was in the peripheral blood of the patient. Non-immune volunteers were inoculated with small quantities of whole blood, defibrinated blood, and blood serum obtained from patients in the acute stage. In all these experiments, attacks of yellow fever followed after the same incubation period which had been observed in the mosquito experiments and in previous clinical experience. At the same time, cultures were made from these fluids, by the methods then in use, but all remained negative, and this was a further proof that the micro-organisms described in the past could not be the cause of yellow fever, since they could all be cultivated on such laboratory media.

It remained to be determined how soon after feeding the mosquitoes became infective and how long they remained so. The first test was made with 14 mosquitoes which had bitten a yellow fever case four days previously. The result was negative. The second test was made on the eleventh day with seven mosquitoes which were still living, and this was also negative. On the seventeenth day, four of the mosquitoes were still alive, and their bites produced an attack of the fever after four days' incubation. Subsequent experiments confirmed these, and showed that the mosquito was not in-

fective until about twelve days after feeding on a patient. This coincided with Carter's observations on the spread of the disease under natural conditions.

It is not easy to keep mosquitoes alive in captivity for long periods, but Reed showed that they were still capable of transmitting the virus fifty-seven days after infection.

In 1901, a report was published by Reed summarizing the findings of the board, of which he was Chairman, in part as follows:

1. "*Culex fasciata* is the intermediate host for the parasite of yellow fever and transmits the fever from a patient to a susceptible individual.

2. An interval of twelve days or more appears to be necessary before the mosquito is capable of conveying the infection.

3. "An attack resulting from experimental infection from the mosquito conveys immunity, just as does the naturally acquired disease.

4. "The disease is not conveyed by fomites, and disinfection of clothing and merchandise is unnecessary.

5. "A house may be said to be infected with yellow fever, only when there are present within its walls contaminated mosquitoes capable of conveying the parasite.

6. "The spread of yellow fever can be most effectively controlled by measures directed to the destruction of mosquitoes and the protection of the sick against the bite of these insects."

This briefly stated is the epochal discovery of Walter Reed and his colleagues, Lazear, Carroll and Agramonte.

The next stage begins with the work of General William C. Gorgas, at that time a Major in the Medical Corps of the Army on duty as Health Officer of Havana during the first occupation of Cuba. He had had yellow fever himself, and was therefore an immune. He was sent by the army, as Sternberg had been before, wherever the disease appeared. By long experience and careful observation he had become one of a small group of physicians very expert in the diagnosis and treatment of yellow fever. To him Reed committed the results of his discovery,—that yellow fever can be transmitted by a mosquito, *Aedes aegypti*, twelve days after it has bitten a yellow fever patient in the first three days of his illness. Reed did not work out any detailed methods of control; that was the great contribution of Gorgas. Gorgas placed all yellow fever cases behind screens to prevent the infection of new mosquitoes; he killed

by fumigation all mosquitoes in houses where yellow fever cases were reported. Since there is a latent period of about twelve days before the mosquito becomes dangerous, it was possible to organize the work so that every yellow fever house could be fumigated and the infected mosquitoes killed, and this was the principal method used in the early work. Better knowledge of the habits of the insect brought improved methods. It was learned that the *Stegomyia* was in a real sense a house pest; the insects were born and most of them lived their entire life in one house, and only slowly did they travel to adjoining buildings when conditions were favorable. This was the small beginning of the important studies of the life history and behavior of the mosquito which has led gradually to simplified methods of control. Havana was thoroughly fumigated, cases were protected by screens, and within ninety days the city was freed from yellow fever, after it had been present for 150 years. This was the triumph of Gorgas.

Think what it signified! Between 1853 and 1900, there had been 35,952 deaths from yellow fever; during the ten years before there had been five hundred deaths yearly; the disease was endemic in Havana, and had been constantly present since the year 1762, when the city was captured by British troops who suffered severely from the fever.

Panama was the scene of the next triumph of Gorgas. Everyone knows about yellow jack on the Isthmus, how it and malaria had helped to conquer the French Canal Company and to bring the work to a standstill. Gorgas went to Panama early in 1904, when the American work was just beginning. Workmen of all classes began to arrive and took up their residence in Panama and Aspinwall, the two terminals of the railroad, and in the many little towns along the line, and this set the stage for an epidemic among the new arrivals.

As you know, yellow fever is a disease which runs a short course, and if the patient survives leaves behind an immunity to subsequent attacks. The immunity is as strong and lasting as any known in medicine; second attacks are unknown; if the patient recovers, he is protected for life. Another important point is that the disease is so mild in young children that it is usually unrecognized, yet nevertheless leaves behind it a permanent immunity.

In Panama, as in Cuba, the children had grown up in constant contact with yellow fever, thus acquiring immunity. The native,

therefore, was not particularly concerned. Although he did not understand it, he knew that in some mysterious way he was protected and not in danger, and that yellow jack was a peril only to the foreigner. This circumstance in the past made it difficult to arouse enthusiasm or secure funds to fight yellow fever from native populations. There were other difficulties also; fumigating old Spanish colonial towns, like Panama, with miles of solid masonry dwellings, many of them with great court-yards and innumerable rooms opening into them, was difficult enough, but in the new settlements along the railroad built of palm leaf thatch, reinforced with packing boxes and scraps of tin, it was practically impossible. The canal builders, however, were resourceful, and great tent-like structures of canvas, were used to cover in a house, or even a group of houses so that fumigation might be done.

This kind of a campaign was expensive; it called for tons of sulphur and tons of pyrethrum powder and a big personnel, and labor on the Isthmus was always costly. The expenditures of the Health Department were large, even for American canal builders. Had the results been immediately forthcoming, the expense would not have been so important, but no disease, not even yellow fever, can be fought over a large area, like the Canal Zone, in a hurry. Cases continued to appear for a year, and the lack of early complete success produced many critics. The obvious difficulties of the situation stimulated increased endeavor and research by Gorgas, Carter, LePrince and others. More complete and careful entomological studies on the life history of the yellow fever mosquito were made. It was learned, for example, that the female selects very carefully a place to deposit her eggs, it is never in any natural collection of water, lakes, ponds or puddles, but always about a dwelling where there are rain barrels, tanks or cisterns for storing water through the dry season, in flower pots about the house, in old tin cans and bottles in the courtyard, in sagging eave troughs, in fact in any artificial water container in the neighborhood of the dwelling. The eggs are deposited on the sides of the containers just above the water level, and are floated off when the water rises. If the water falls, the eggs dry on the wall, but remain viable months on end, and hatch out when the water is renewed or the rains begin. The larva or wiggler stage lasts a week in the tropics; the pupa or tumbler stage a couple of days, and then the fully grown adult insect emerges. The male lives on fruits, but the female, before egg laying must have

a meal of blood. She is a quiet mosquito, and bites in the day time, most often just before dusk; she flies up quietly behind one's back as a rule and bites so quietly and painlessly that her victim may be quite unconscious of her presence. After a few days more, the blood being digested, she seeks to deposit her eggs somewhere in the immediate neighborhood.

In Havana, Gorgas had fought the mosquito by screening water containers, barrels, tanks and cisterns, or, where this was impossible, by using oil on the surface, which poisons the larva. As the developmental cycle of the mosquito is short, a weekly inspection of all rain barrels or other containers will show, if breeding be present, when the larvae can be destroyed. The older part of Havana was supplied with running water so that neither tanks nor barrels were necessary for storage, and it was noted that in such districts there were few if any *Aedes aegypti*, and it was realized that a good water supply system, doing away with the household storage of water, was a good and certain measure for abolishing yellow fever. Indeed, it is not improbable that the disease ceased to visit Philadelphia, New York and other eastern cities because the enlargement of the public water system abolished the breeding places and so broke the chain which made yellow fever possible. The improvement of the water system of the cities of Panama and Colon facilitated the campaign in the Canal Zone. Such work, however, is slow and costly. As time went on, more and more attention was directed to the larval stages of the mosquito, and less to the adult. The practice of fumigation gradually diminished until under the present plan of Doctor Henry R. Carter, it has no place in the program; all attention is concentrated on destroying the mosquito before it reaches the adult stage.

Success in Panama was attained in May, 1905, after one year's work. From that date to the present time, no new cases have originated on the Isthmus. The second great battle of Gorgas was won. Of course, the work in Panama could not stop; it was necessary to hold the ground gained. Quarantine can do much to keep the disease away by holding all travelers for the maximum period of incubation (six days) and by fumigating the ship with hydrocyanic acid to kill mosquitoes. Fortunately, however, quarantine can be reinforced by anti-mosquito measures. Gorgas found that his inspectors could keep down mosquito breeding in the cities and settlements by constant vigilance. Daily and weekly reports showed

the number of houses in which breeding still occurred. When there was only a small percentage of houses, five to ten, producing mosquitoes, it was observed that new cases ceased to occur. A point had been reached where, according to the doctrine of chance, there were not enough mosquitoes present to bite the sick man during the first three days of his illness and subsequently to find susceptible individuals to whom to convey the virus. This percentage was called the critical number, and after it had been reached and maintained for a time that particular place became non-infectible. No matter how many cases of yellow fever were introduced, the disease could not spread owing to the scarcity of *Aedes aegypti*. This is another truth of importance in yellow fever campaigns. A city or a seaport can be made proof against the introduction of new cases from without by reducing the mosquito population, and so gradually experience developed sure and certain methods for the campaign.

It had long been recognized that the disease died out spontaneously in small settlements, and this was correctly explained as failure of the human host. When introduced into a village where mosquitoes are numerous, practically everyone, old and young, is inoculated at about the same time; some die, but most recover, and then the whole population is immune. It matters not how many mosquitoes there are, or how many cases are brought into town, there will be no fever, because there are no susceptible human beings to act as hosts. On the other hand, the disease never died out in the larger cities, such as Havana, Vera Cruz, and Panama because strangers were always arriving, and such places were called endemic centers. In the yellow fever days, about fifty thousand immigrants passed through Havana yearly, and there were many visitors from our own country; in addition there were thousands of children born, and so we conceive that in large cities in the presence of a sufficient number of mosquitoes, the disease was kept alive from year to year by sickness among the new arrivals and by very mild and usually unrecognized attacks among the children.

With the opening of the Panama Canal, the disease assumed new importance, because of the fear that it might be carried to the Far East. A committee was formed by the International Health Board, consisting of Gorgas, Carter, Guiteras and Noguchi, which visited Ecuador and Peru, Colombia, Venezuela and Brazil. The place selected for the first attempt in the world-wide campaign was Guayaquil, the principal port of Ecuador. Yellow fever had prevailed

there constantly for fifty years; it had acted as a seed bed, from which the disease was distributed, not merely in Ecuador, but by ships all up and down the west coast of South America. So dreaded was Guayaquil that mail ships stopped there only twice a month. Nowhere in the world was a city of 100,000 inhabitants so isolated.

The commission believed that Guayaquil was the only true endemic focus on the west coast of South America and was the "key point" for that region, and they ventured the prophesy that once the city was controlled the secondary foci along the railroad and up and down the coast to Colombia in the north and Peru in the south would all disappear. We shall see that this prophesy was fulfilled to the letter.

Work was begun in 1918 with Dr. M. E. Connor in charge. His story is an interesting one. He encountered the usual difficulties due to ignorance and conservatism. In spite of the demonstrations furnished by the successful campaigns in Havana, Panama, Rio de Janeiro and Santos, the Ecuadorian public was still rather incredulous of the value of anti-mosquito campaigns. This was not unreasonable because the difficulties encountered in Guayaquil were extraordinarily great. Years before the authorities had started control operations based on the practice in Havana; but although the results had been promising at times, the total result was a failure, and they had come to doubt the simple doctrines of Reed and Gorgas. Connor, however, proceeded with his study and soon found that *Aedes aegypti* were common in the city, and that by far the greater number were bred in water storage tanks in the houses. The water supply of Guayaquil was so inadequate that it was turned on for only one and a half hours out of each twenty-four, consequently every house was provided with a storage tank connected with the water system. The main supply pipe for the city of 100,000 was only seven inches in diameter. The tanks were of all sizes and mostly built of wood and lined with tin. As the water itself was not filtered, it still contained considerable sediment when it reached the householder. To get clean water, it was the universal custom to have the outlet pipe, not at the bottom of the tank, but a few inches above to catch this sediment. As a result, there was always an inch or two of water to furnish a breeding place for the yellow fever mosquito and each dwelling raised its own supply.

Connor's method was simple. He limited his attention to one thing, that is to stopping the breeding in these storage tanks, and

paying little or no attention to anything else at first, not even the sick. The existing hospital and dispensary system cared for the sick just as in preceding years. He induced each householder to cover the tank and to make it mosquito proof. When the work in each house was completed, the tanks were inspected and officially sealed with a warning, authorized by the police, that the cover must not be removed under heavy penalties. His inspectors examined all tanks weekly to see if the seals were intact. This work was done in the center of the city where almost all the cases occurred. In the poorer sections, water was stored in barrels and earthenware jars; some of these could be made mosquito proof, but with most this was impossible. Connor introduced something new in yellow fever work, that is, the use of fish as destroyers of mosquito larvae. It was found that one or two minnows in a barrel or cistern would keep it free.

The usual rules were followed in the campaign; that is, the city was divided into districts with a supervisor for each. The districts were subdivided into sections of about 400 houses, and an inspector was assigned to each section. He started out each Monday morning at the same house, and visited in turn all the 400, examining with a good electric flash light every water container. If breeding was found anywhere, the water was dumped out, or a man with fish, or oil, or a carpenter with supplies and screens visited the house next day to do whatever was necessary to stop breeding permanently. This simplified program, dealing as it did with the larval stage of the mosquito, was naturally slow in producing its effect, since no attempt was made to kill adult mosquitoes, and it required some months at least to stop breeding permanently in a large city. The work was launched in November, 1918, when there were 80 to 90 cases monthly, but no effect was produced in December or January. In February, the number of cases fell to half, in March to a quarter, in April and May there were only two or three, and in June, 1919, after six months' work there were no more, and the battle seemed to be won. Nevertheless, work was continued until the index was so low that the city became noninfectible and was kept so for a year and a half before the work was considered successful.

Just before the cessation of the epidemic in Guayaquil, in the spring of 1919, an outbreak occurred in Peru, the adjoining country on the south, which no doubt had its origin in Guayaquil. It was brought under control in the northern most province, but not until

the infection filtered south into the desert country, and in 1921 a large epidemic occurred in Lambayeque.

At about this time the Peruvian government had engaged an America sanitary expert from the Panama Canal, Dr. Henry Hanson, to undertake malarial work in Peru, which is one of their great problems. Dr. Hanson had had experience in yellow fever control work and took charge of the campaign. The disease spread with great rapidity and invaded so large an area that 10,000 cases and 1500 deaths occurred.

The campaigns in Ecuador and Peru, completed in 1922, mark the end of the disease on the west coast of South America.

The cause of the disease had remained a mystery through all these years, and in 1918 we were still in ignorance. Dr. Noguchi discovered the causative micro-organism in Guayaquil in 1919. It is an exceedingly small and delicate spiral which cannot be stained with the commoner laboratory dyes, nor seen with the ordinary microscope. It belongs to a small group of micro-organisms which were unknown in the days of Sternberg and Reed, and which require for their demonstration a very refined technique and the dark-field or ultra-microscope. Noguchi also produced in guinea pigs a disease resembling human yellow fever, and showed by serological tests that the new organism, called by him the *Leptospira icteroides*, gave the reaction with the serum of convalescents indicative of casual relationship. Noguchi was also able to transmit the disease from man to guinea pigs and from one guinea pig to another by means of mosquitoes. He tested his results by all known methods except the single one of producing the disease in human beings with cultures of his *leptospira*. I think that probably all of us believe that the proofs he has offered are sufficient and that the undoubted risk of an experiment of human beings should not be taken. His discovery was surprising; no one had expected it to turn out just as it did. Most of us believed that the cause of the disease, when found, would be a protozoön rather than a spirochaeta, which is a group name for micro-organisms lying in the border land between bacteria and protozoa.

In later expeditions, Noguchi, or his pupils, have found the same *leptospira* in the yellow fever of Peru, Yucatan, Vera Cruz and Brazil.

Later Dr. Noguchi prepared a vaccine for the prevention of infection, and a serum for treatment which have given promising

results. Their use permits non-immune physicians to work in yellow fever campaigns, with almost no danger of death, a very desirable result, since in the old days this plague exacted its toll from physicians, investigators and laymen alike. Noguchi has completed the work begun so long ago by Sternberg, Reed, Gorgas and Carter, and has robbed yellow fever of its last mystery. Each advance in knowledge simplified methods of control.

After Guayaquil came Central America, long notorious for its epidemics. In 1918 and 1919, it overran parts of Nicaragua, Honduras, Salvador and Guatemala. The four governments organized control campaigns and placed the direction in the hands of General Gorgas and his assistants. The plan adopted was not unlike that so successfully used in Guayaquil. Fish as larvacides were used to a greater degree than ever before. The history of the disease in this region is not yet accurately known and will not be until it has been completely stamped out. It seemed in 1921 as though this had already been accomplished, but this year, 1924, and outbreak occurred in Salvador, lasting from June to October. It is probable that an unsuspected endemic focus exists in Central America calling for a prolonged campaign.

In Mexico, there was an old endemic focus in Merida, Yucatan, where the disease had prevailed since it was first recognized in 1648. Other foci existed along the gulf coast, particularly in Vera Cruz, from the 17th to the 20th century. To Dr. Liciaga, Chief Health Officer under Diaz, belongs the credit for cleaning up this region soon after the success of Gorgas in Havana, and it remained free until the disease was reintroduced, probably from Merida, Yucatan, during the ten years of revolution. From whatever source it came, it soon assumed alarming proportions, for in 1920, there were 250 deaths; the number fell in 1921 to fifty, in 1922 to twenty-five, and there has been none since. The control work has not ceased but is being continued in all the principal ports. It is, of course, the hope of the Mexicans that it has been eliminated, and since two years have passed without cases it is possible that it has been.

The difficulties in Mexico were many. The country suffered greatly during the revolution, whole villages had been destroyed and here and there the people were living in temporary huts,—the worst possible situation in a yellow fever country. Not all Mexico lies in the yellow fever belt; it is only in the hot lowlands, which, however, constitute almost half the total area of the country, that

the *Aedes aegypti* can breed,—in the mountains the temperature is too low, and the higher regions of Mexico have never suffered. Again, because of the disturbed condition of the country, the army was active and troops, most of whom were non-immune from the plateau region, were being sent continually into yellow fever areas. No more severe test of the success of the work can be imagined.

In 1923, Northern Brazil was still a danger point. The disease was introduced there in 1689, but died out spontaneously. It was reintroduced in 1849 by a ship from New Orleans and spread up and down the coast to the great ports of Brazil. In Santos, it was so virulent that at one time a hundred ships lay helpless in the harbor because of the great number of deaths among the crew.

Following the work of Gorgas in Havana, Oswaldo Cruz, Ribas, and Lacerda stamped out the disease in Rio de Janeiro, Santos and all southern Brazil; it lingered, however, in the tropical ports of the north. A campaign was started by the Brazilians, in collaboration with Dr. Joseph H. White, in the fall of 1923, and is still being carried on. Cases ceased to appear in the ports, which are the "key points" of the campaign, in the spring of 1924, but occasional cases are still reported from the villages of the interior. As the population in the back country is sparse, and there is little immigration, it is possible that the disease is being eradicated.

Since 1900, we have seen the disease exterminated from Havana, Panama, New Orleans, Guayaquil, Santos and Rio. It disappeared from Vera Cruz only to return during the late revolution, but it has again been eliminated, nor have any cases been seen in Yucatan, the oldest focus of the disease, since 1920.

Each year since 1919 has seen some improvement. The march of events has demonstrated that present day methods of fighting the fever are correct, and that barring revolutions we are bound to succeed in eliminating yellow fever from this hemisphere within a reasonable time. The way is known; trained men are available; and the money will undoubtedly be forthcoming. A government cannot spend money more profitably than by investing it in yellow fever prophylaxis, for after its elimination history shows that international trade, unhampered by quarantine, increases by leaps and bounds.

There is one other place, however, where the disease exists and that is on the west coast of Africa, especially along the slave coast, Ivory Coast and Gold Coast, and also in Nigeria and as far south as Portu-

guese Angola and north to French Senegal. How long it has been there no one knows. Since the 16th century there has been frequent communication between the Caribbean and the slave coast of Africa, and there is every reason to believe that the disease was carried back and forth. The fight must be continued in West Africa, for the danger will not disappear until the disease becomes extinct.

As you see, there is ground for believing that present day methods of control may exterminate the disease within a measurable time. Some delays and disappointments are bound to occur, for we can only learn by experience where the permanent endemic foci exist, and where prolonged intensive work is needed. The campaign, however, must not be delayed too long. The Far East has never been visited by this plague; if ever introduced, no one can estimate the damage which would ensue, since the yellow fever mosquito is everywhere present.

Steamships do not carry the mosquito; it will not breed in iron water tanks, and there is no danger except when the voyage is short, less than the six-day incubation period. It was the sailing vessel with its wooden water butts that propagated mosquitoes throughout the voyage and which made possible the outbreak of an epidemic en route, and landed on its arrival in port both yellow fever cases and infected mosquitoes. To-day we are confronted with newer forms of transportation,—the automobile and the aeroplane. Already the automobile, outdistancing the railroad, has carried the disease from the West African Coast into the French Sudan, and unless the disease be controlled in the endemic foci on the coast it will do so again.

Travel by air is increasing, particularly in regions where railroads and highways are lacking. So long as there is yellow fever within five days' travel from us, there is danger that the disease may be introduced into the United States again. It behooves us, therefore, to waste no more time, but to eradicate it in the shortest period possible.

I shall conclude by referring briefly to public health progress in combating malaria, another mosquito borne disease. Yet there its similarity ceases. Compared to malaria, the fight against yellow fever is simple and easy. Yellow fever is a terrifying visitation which paralyses any community it attacks. We are, however, familiar with malaria; no newspaper deigns to mention it; yet yellow fever kills very few persons while something like two millions a year

die from malaria. There is no other world disease which causes so fearful a mortality, not even tuberculosis, and the deaths are not the worst part; two or three hundred may be ill for every death, and the great number of sick days is a frightful handicap to any community. A yellow fever city like Havana in the old days could be prosperous, brilliant and gay in spite of yellow fever, since the native was immune, but there is no real immunity to malaria, in the same sense, and it has prevented growth of population and even caused depopulation of great areas. It is not improbable that the decadence of ancient Greece and Rome was due to this disease.

It, however, can also be fought, yet the battle is not easy. There is only one species of mosquito capable of conveying yellow fever; for malaria, however, we have a score or more, each one with different habits which must be studied before intelligent work can be done. For yellow fever one plan is possible, because we have only the one insect to fight, and the same plan works wherever it has been put into practice; it is based on the finding that the mosquito is domestic in character, dependent for its existence on the carelessness of man. The anophelines which carry malaria are wilder insects and remain about the house only long enough to steal and digest the meal of blood.

After Ross and the Italians had shown that malaria is transmitted by certain anopheline mosquitoes and in no other way, it seemed for a time as though the disease might be conquered or controlled without great difficulty. Many attempts were made and in most cases the result was failure, for the early malariologists under-estimated the difficulties. Although the human carrier of malaria is not a chronic carrier, in the same sense as in typhoid fever, where the condition lasts for a life time, the carrier state does last a long time, one, two or three years, and perhaps a little more, after the last new infection. This is one of the great difficulties which makes it necessary to control the breeding of the anophelines very thoroughly for at least this period, when the population is a stable one.

If, on the other hand, the population is constantly changing because of seasonal work such as harvesting the crops, the control must be kept up indefinitely. The early malariologists scarcely realized this, and ceased their efforts too early, and many came to the conclusion that domination of the disease by mosquito control was impossible.

This unfortunate conclusion led many, including Robert Koch,

to make a flank attack on the enemy; that is, to try to destroy the parasites in the blood of the human being by the administration of quinine. Under special conditions this can be done; the population treated, however, must be small, very intelligent and under perfect control. Merely to state this shows the difficulty, and a high degree of success has only been obtained in armies and navies and well organized expeditions. Theoretically it does seem quite possible to overcome this disease by destroying the parasites in human beings; on a large scale, however, it has not been a very successful method although it has been given an extensive trial in Italy. In that country it has undoubtedly accomplished wonders in reducing the death rate, but nowhere does it seem to have eliminated this disease. This is perhaps due to the well known fact that even the intelligent do not take their quinine willingly or regularly, and because it is so difficult to administer enough quinine to children, to the poor, to vagabonds and beggars, and to the ignorant generally, to cure the disease.

In the early days, therefore, both methods of attack seemed to be failures.

Gradually a new group of malariologists have grown up who have devoted themselves to the study of the life history of the many species of anophelines. They have come to believe that there is no general rule for guidance in anti-malaria work, as was believed in the early days, but that each species of anopheline must be studied until the weak point in its life history is found, then the attack can be made with some hope of success. For example, Jerusalem has been a malarious city for centuries; surveys showed about one quarter of the population constantly sick. Studies made on the ground showed the principal and almost the only anopheline present was *Anopheles bifurcatus*, which breeds only in cisterns and wells, and not in swamps or streams. Although it should not be considered a simple matter, it is nevertheless possible to stop the breeding of this malaria carrier by oiling the 7000 cisterns of the old city. This was first done by the medical corps attached to Allenby's army, and it has been continued by the present mandate government with complete success. Malaria has disappeared from Jerusalem, and from most of the cities of Palestine.

The same mosquito is found in Italy, yet there reports indicate that it does not breed in cisterns, that it is not found in cities or in houses, but is a wild sylvan mosquito which does not carry malaria.

Other illustrations might be given, but they could not show more clearly that malaria is a local problem; that generalizations are dangerous and that safety and success in fighting the disease can be attained only by studying in each place the anopheles found there, learning which of the several species is important, and concentrating control measures on the dangerous species.

Fighting malaria is like attacking twenty different kinds of yellow fever, each one must be fought in a different way. Yet in spite of the difficulties, we know that progress is being made each year, and that the disease in the United States is slowly but constantly receding farther south, and that we can look forward to a yearly improvement. We need money and brains, and more especially brains, to eradicate malaria, since each locality has its own special problems to solve, and without intelligent direction all the money in the world might be wasted in this one fight. Malaria is a world problem; everywhere in the tropics and sub-temperate zones it prevails, completely around the globe. The methods we develop in our struggle with malaria in this country are important, not merely to us, but to the rest of the world. Since the war, the disease has invaded eastern Europe, Russia, Poland and the Balkans, causing an enormous amount of sickness and retarding the return to normalcy. To overcome this great handicap, there is need, not so much of money as of knowledge, leadership and example.

In public health the greatest thing is, of course, education, both of officials and of the public, and one of the avenues of approach to enlightenment of the public is by means of demonstrations, showing the possibilities of success. From this point of view campaigns against yellow fever and malaria have a value not merely for themselves, but also as demonstrations of what public health means to communities.

By studying and overcoming our own problems in malaria, just as we have in yellow fever, we can contribute to the improvement of world health by furnishing more accurate knowledge, better leadership and a good example.

## REPORT OF THE TREASURER OF SIGMA XI FOR THE YEAR 1924

On February 1, 1924, in accordance with the instructions of the annual Convention of Sigma Xi on December 28, 1923, the Treasurer issued a call to all the chapters for the annual dues of seventy-five cents per chapter member and one dollar initiation fee for each new member. The dues of all the chapters except two, the District of Columbia and the University of Oregon have been paid.

RECEIPTS				
1924	Chapter	Assessment	Initiation Fee	Total
Jan. 1	Cash on hand .....			\$1964.08
Feb. 27	California.....	\$ 135.00		135.00
Feb. 27	Colorado.....	38.25	\$ 9.00	47.25
Feb. 27	Rensselaer.....	29.25		29.25
Feb. 27	Pennsylvania.....	117.00		117.00
Feb. 27	Illinois.....	133.50	49.00	182.50
Feb. 27	Rutgers.....	30.00	1.00	31.00
Feb. 27	Yale.....	94.50		94.50
Feb. 27	Purdue.....	46.50	7.00	53.50
Feb. 27	Washington.....	40.50		40.50
Feb. 27	Indiana.....	52.50		52.50
Feb. 27	Kentucky.....	31.25		31.25
Feb. 27	Minnesota.....	178.50	56.00	234.50
Feb. 27	Washington (State).....	46.50		46.50
Mar. 8	North Carolina.....	20.25	9.00	29.25
Mar. 8	Wisconsin.....	198.00		198.00
Mar. 8	Chicago.....	157.50	65.00	222.50
Mar. 31	Texas.....	37.50	3.00	40.50
Mar. 31	Iowa.....	36.00		36.00
Mar. 31	Pennsylvania.....		43.00	43.00
Apr. 9	Kansas.....	57.00		57.00
Apr. 9	Cornell.....	135.00		135.00
Apr. 23	North Dakota.....		18.00	18.00
May 7	Virginia.....	21.00		21.00
May 7	California.....	13.50	101.00	114.50
May 7	Iowa.....	61.50		61.50
May 7	Washington.....		6.00	6.00
June 16	Ohio State.....	127.50	10.00	137.50
June 16	Kansas.....		19.00	19.00
June 16	Cornell.....	8.25	42.00	50.25
June 16	Washington.....		29.00	29.00
June 16	Northwestern.....	46.00	26.00	72.00

## RECEIPTS (CONCLUDED)

1924 .	Chapter	Assessment	Initiation Fee	Total
June 16	Columbia.....	54.80	64.00	118.80
June 16	Mayo.....	33.00	19.00	52.00
June 16	Case.....	19.50	14.00	33.50
June 16	Texas.....		3.00	3.00
June 16	Iowa.....		15.00	15.00
June 16	Brown.....	40.50		40.50
June 16	Rutgers.....	12.00	19.00	31.00
June 16	Syracuse.....	45.00	16.00	61.00
June 16	Yale.....		46.00	46.00
June 16	Worcester.....	29.25	21.00	50.25
June 16	Missouri (1923-24).....	108.00	57.00	165.00
June 26	Wisconsin.....		47.00	47.00
June 26	Iowa State.....	58.50	36.00	94.50
June 26	Idaho (1923-24).....	53.00	14.00	67.00
June 26	Johns Hopkins.....	79.50	94.00	173.50
June 26	Pennsylvania.....		3.00	3.00
June 27	Washington State.....	45.00	24.00	69.00
July 22	McGill.....	83.25	26.00	109.25
July 22	Chicago.....		35.00	35.00
July 22	Wisconsin.....	20.25	3.00	23.25
Oct. 27	Stanford.....	67.50	59.00	126.50
Oct. 27	California.....	40.00	1.00	41.00
Oct. 27	Swarthmore.....	9.75	6.00	15.75
Dec. 10	Rensselaer.....		37.00	37.00
Dec. 10	Brown.....		25.00	25.00
Dec. 16	Union.....	16.50	8.00	24.50
Dec. 26	Michigan.....	144.00	54.00	198.00
Dec. 26	Johns Hopkins.....	12.75	11.00	23.75
Dec. 26	Nebraska.....	45.00	25.00	70.00
Dec. 26	QUARTERLY Subscriptions..			62.00
Dec. 26	U. S. Post Office.....			5.00
Dec. 26	Washington State.....	45.00	24.00	69.00
		<u>\$2954.30</u>	<u>\$1299.00</u>	<u>\$6284.38</u>

## DISBURSEMENTS

QUARTERLY—December 1923.....	\$ 340.50
QUARTERLY—March 1924.....	173.73
QUARTERLY—June.....	144.86
QUARTERLY—September.....	182.99
Secretary's Office Assistant.....	478.50
Secretary's Office, general expenses.....	219.17
President's Office.....	93.49
Travel Expenses—Executive Committee.....	645.14

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25.00  
24.50  
98.00  
23.75  
70.00  
62.00  
5.00  
69.00

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284.38



*Courtesy of Genford*

C. E. DAVIES  
Chairman of the Alumni Committee



*Harris and Ewing*

Dr. W. F. DURAND  
Member of the Executive Committee

# REPORT OF TREASURER FOR 1924

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## DISBURSEMENTS (CONCLUDED)

Check returned.....	69.00
Collection charges.....	2.19
Total Disbursements.....	\$2349.57
Cash on hand, Dec. 31, 1924.....	3934.81
	<u>\$6284.38</u>

December 31, 1924.

GEORGE B. PEGRAM,  
*Treasurer, Sigma Xi Society*

We have audited the accounts of the treasurer of the Society of Sigma Xi for the year ending December 31, 1924, and certify that the income shown by the books of the treasurer has been duly accounted for, that payments have been properly vouched and that the balance sheet and accounts submitted contain a true statement of the financial condition of the Society.

Date: March 5, 1925.

HAROLD W. WEBB  
S. L. QUIMBY  
*Auditors.*

## ALUMNI FUND

Total Receipts.....	\$4106.78
Disbursements:	
Clerical Services.....	\$170.25
General expenses, supplies, etc.....	238.02
Payment of Fellowship Stipend.....	898.66
Non-negotiable checks.....	27.00
Collection charges.....	5.00
Total Disbursements.....	<u>1347.93</u>
Cash on hand, Dec. 31, 1924.....	\$2758.85

## OFFICERS ELECTED AT THE DECEMBER CONVENTION

The newly elected member of the Executive Committee, DR. WILLIAM F. DURAND, was born in Bethany, Connecticut, on March 5, 1859, and was graduated in 1880 from the United States Naval Academy. For the next seven years he was in Naval Service, serving in the Engineers Corps. In 1887 he resigned to take up teaching as a profession, first at the Michigan State Agricultural College where he was professor of mechanical engineering until 1891, and then at Cornell where he was professor of marine engineering until 1904. It was in 1904 that he went to Stanford University where he has been professor of mechanical engineering ever since, retiring from active service in June of this year.

Dr. Durand's most noteworthy service, possibly, was rendered to

the country at the time of the war. In 1917 he was in Washington as chairman of the National Advisory Committee for Aeronautics (of which Committee he has been a member since 1915), and vice-chairman of the National Research Council Committee on Engineering. The following year he spent in Paris as Scientific Attaché to the United States Embassy, representing the National Research Council, and charged with the duty of effecting and maintaining an interchange between Paris and Washington of technical and scientific information regarding war problems, and also as a member of the Interallied Commission on War Inventions. His service there can scarcely be overestimated.

As an inventor Dr. Durand is best known for his three-point caliper, for determining true circular contours, and his radial planimeter for averaging ordinates in polar diagrams. As an author he is known for three books, *Resistance and Propulsion of Ships* (1898), *Practical Marine Engineering* (1901), and *Hydraulics of Pipe Lines* (1921), in addition to possibly a hundred technical papers published in governmental reports and the technical press.

Dr. Durand has been a member of the Society since 1883, and was a Vice-President from 1911 to 1913. He has long been active in the San Francisco Local Section and was its chairman in 1919-1920. He is also a member of the American Institute of Electrical Engineers, the American Society of Naval Architects and Marine Engineers, the American Society of Naval Engineers (gold medal and life membership in 1899), the Society Technique Maritime, the National Academy of Sciences, the American Philosophical Society and the American Academy of Sciences.

MR. CLARENCE E. DAVIES, re-elected as member of the Alumni Committee and later chosen by the committee as its chairman for the ensuing year was born in Utica, N. Y., March 15, 1891. He was educated in the public schools of Utica and at Rensselaer Polytechnic Institute, from which he was graduated in 1914, with the degree of M.E. He entered the employ of the Smith Premier Works of the Remington Typewriter Company at Syracuse, N. Y., and served in various engineering and production capacities until September, 1917, when he was commissioned in the Ordnance Department and assigned to Frankford Arsenal. There he served in the Artillery Ammunition Division, acting as superintendent of the fuse shop from January, 1918, to January, 1919, when he left the service with the rank of captain.

In March, 1920, he became Associate Editor of *Mechanical Engineering*, the Journal of The American Society of Mechanical Engineers, later being advanced to the position he now holds, that of Assistant Secretary and Managing Editor of the publications of the Society.

#### SIGMA XI AID TO RESEARCH

Sigma Xi Alumni have made available a sum of money to be used annually in the support of research. For the year 1925-26 the sum of \$2000 will be awarded by a special committee consisting of Dr. W. R. Whitney, Director of Research at the General Electric Company, Professor E. L. Thorndike of Columbia University and Dr. John H. Northrup of the Rockefeller Institute for Medical Research. This fund will be granted by the committee to selected workers who have shown devotion to science and who merit assistance in further research work. The aid granted will not be limited to any particular field of work, nor will it take any particular form. It may be awarded in the form of a fellowship or it may be given to purchase apparatus, to help in publication or to pay assistants.

Applicants for aid from this fund should be made before May 1, 1925, to Dean Edward Ellery, Union College, Schenectady, N. Y. Applications should state the kind of assistance desired, the nature of the problem under study, or to be studied, and the place where the research is being done, or is to be done. Applicants should present their educational and research experience, degrees received and titles of publications. There should also be a statement regarding the importance of the problem in his particular field from at least two individuals competent to express judgment.

Awards will be made by June first and will be available after August 1, 1925, and up to August 1, 1926.

#### RECENT CONTRIBUTIONS TO THE SIGMA XI ALUMNI FUND

<i>Name</i>	<i>Chapter</i>	<i>Address</i>
Anslow, Miss G. A.	Yale Chapter	Northampton, Mass.
Arnold, C. B.	Purdue Chapter	Cleveland, Ohio
Batchelor, H. W.	Idaho Chapter	Madison, Wisconsin
Bockwaldt, Miss J.	Iowa Chapter	Galva, Iowa
Boyer, R. L.	Ohio Chapter	Brooklyn, N. Y.
Bryson, H. J.	North Carolina Chapter	West Asheville, N. C.
Bulger, Dr. H. A.	Yale Chapter	New Haven, Conn.
Christophersen, E.	Yale Chapter	Honolulu, T. H.
Clyde, H. S.	California Chapter	Berkeley, California

## RECENT CONTRIBUTIONS (CONTINUED)

<i>Name</i>	<i>Chapter</i>	<i>Address</i>
Coe, F. M.	Ames Chapter	Lincoln, Nebraska
Cox, Miss C. M.	Stanford Chapter	Whittier, California
Davis, H. P.	Case Chapter	Cleveland, Ohio
Denault, C. L.	Worcester Chapter	Wilkesburg, Pa.
Domogalla, B. P.	Wisconsin Chapter	Milwaukee, Wisconsin
Downs, C. M.]	Nebraska Chapter	Lincoln, Nebraska
Durst, C. E.	Illinois Chapter	Chicago, Illinois
Farrell, F. D.	Kansas Chapter	Manhattan, Kansas
Fay, Dr. T.	Pennsylvania Chapter	Philadelphia, Pa.
Feist, G. V.	Missouri Chapter	Kansas City, Mo.
Feiger, E. A.	Minnesota Chapter	Baton Rouge, La.
Frame, F. H.	Worcester Chapter	Rolla, Mo.
Gatewood, Miss E. S.	Yale Chapter	Newport News, Virginia
Gelman, H. M.	Pennsylvania Chapter	Philadelphia, Pa.
Gemmer, E. W.	Syracuse Chapter	Buffalo, N. Y.
Goodenough, Miss F. L.	Stanford Chapter	Minneapolis, Minn.
Gordon, Kenneth	Missouri Chapter	Columbia, Mo.
Gray, Miss E.	Chicago Chapter	Detroit, Mich.
Grebe, J. J.	Case Chapter	Midland, Mich.
Gronmeyer, F. G.	Washington U. Chapter	St. Louis, Mo.
Harman, C. T.	Ohio Chapter	Detroit, Mich.
Hawkins, L. P.	Nebraska Chapter	Omaha, Nebraska
Hazzard, R. T.	California Chapter	Colorado, Texas
Hill, J. W.	Washington U. Chapter	Boston, Mass.
Hitch, Miss M. A.	Chicago Chapter	Washington, D. C.
Horr, W. H.	Chicago Chapter	Lawrence, Kansas
Hotchkiss, N.	Syracuse Chapter	Washington, D. C.
Hughes, W. M.	Ohio Chapter	Zanesville, Ohio
Hyde, Miss E. C.	Illinois Chapter	Aurora, N. Y.
Jenison, G. C.	Wisconsin Chapter	Madison, Wisconsin
Kassing, B. L.	Syracuse Chapter	Erie, Pa.
Katz, David	Missouri Chapter	Washington, D. C.
Kaufman, Miss C.	Brown Chapter	Tuckerton, N. J.
Klauder, Dr. J. V.	Pennsylvania Chapter	Philadelphia, Pa.
Krueger, A. P.	Stanford Chapter	Stanford, California
Kusner, J. H.	Pennsylvania Chapter	Pawling, N. Y.
Larson, Miss O.	Missouri Chapter	Tallahassee, Fla.
Learned, S. S.	Kansas Chapter	Bartlesville, Okla.
Leiter, H. G.	Case Chapter	Holyoke, Mass.
Lougee, F. M.	Illinois Chapter	Kenka Park, N. Y.
Lounsbury, J. A.	Wisconsin Chapter	Madison, Wisconsin
Macnab, J. A.	Nebraska Chapter	McMinnville, Oregon
Mangelsdorff, A. F.	Rutgers Chapter	Union Hill, N. J.
McClure, Miss K. L.	Northwestern Chapter	Hancock, Mich.
McCrosky, T. T.	Yale Chapter	Brussels, Belgium

# REPORT OF TREASURER FOR 1924

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## RECENT CONTRIBUTIONS (CONCLUDED)

<i>Name</i>	<i>Chapter</i>	<i>Address</i>
McGinnies, W. G.	Chicago Chapter	Missoula, Montana
Mears, Miss F. M.	Cornell Chapter	Baltimore, Md.
Michael, F. L.	Illinois Chapter	Schenectady, N. Y.
Montonna, R. E.	Yale Chapter	Minneapolis, Minn.
Motschman, A. V.	Illinois Chapter	Berkeley, Calif.
Mourane, J. H.	North Carolina Chapter	High Point, N. C.
Neumann, F. R.	Chicago Chapter	Columbia, S. C.
Nicholes, J. K.	Stanford Chapter	St. George, Utah
Phemister, T. C.	Chicago Chapter	Glasgow, Scotland
Quaintance, Miss E.	Syracuse Chapter	Delaware, Ohio
Radel, J. L.	Yale Chapter	Bridgeport, Conn.
Rigler, Dr. L. G.	Minnesota Chapter	Minneapolis, Minn.
Robinson, Miss G. E.	Missouri Chapter	Rome, Ga.
Robinson, Wm.	Kansas Chapter	St. Paul, Minn.
Rose, W. C.	Ohio Chapter	Cleveland Heights, Ohio
Royal, A. M.	Yale Chapter	Hartford, Conn.
Sanborn, Miss E. I.	Stanford Chapter	Eugene, Oregon
Saunders, Miss F.	Missouri Chapter	Russellville, Ky.
Scheck, Dr. M. G.	Cornell Chapter	Des Moines, Iowa
Schott, E. L.	Missouri Chapter	Columbia, Mo.
Schwitalla, A. M.	Washington U. Chapter	St. Louis, Mo.
Senor, Miss M.	Kansas Chapter	Dodge City, Kansas
Shen, E.	Stanford Chapter	Palo Alto, California
Smith, Alfred	Wisconsin Chapter	Davis, California
Smith, C. H.	Stanford Chapter	Palo Alto, California
Smith, Miss N. M.	North Carolina Chapter	Charlotte, N. C.
Smith, Miss V. I.	Brown Chapter	Stamford, Conn.
Smolak, G.	Idaho Chapter	Wallace, Idaho
Space, R. L.	Idaho Chapter	Wilkinsburg, Pa.
Stray, G. R.	Stanford Chapter	Schenectady, N. Y.
Uyei, Nao	Illinois Chapter	Denver, Colorado
Wagner, W. P.	Pennsylvania Chapter	Philadelphia, Pa.
Walker, A. T.	California Chapter	San Francisco, California
Wallace, G. I.	Illinois Chapter	Urbana, Illinois
Weyandt, A. S.	Case Chapter	Midland, Michigan
Winchester, W. W.	Stanford Chapter	Burbank, California
Worley, R. W.	Case Chapter	Canton, Ohio

## REPORT OF ALUMNI COMMITTEE

The Constitution of Sigma Xi adopted at the Boston Convention in 1922 changed the names of the two classes of membership from "active and alumni" to "chapter and alumni" and thereby removed the possibility of inference that alumni members were of necessity inactive. It is a fact, however, that about two-thirds of the enrolled members of Sigma Xi are alumni and the great majority have been inactive. The constitution of 1922 provided an alumni committee through which this group of 14,000 alumni could be organized and brought to participation in the activities of the Society. I have the great honor of presenting the first report of an Alumni Committee to the Convention of Sigma Xi.

It is no small task to organize the alumni and bring them into contact with the work of the Society. Furthermore, in our present scheme of existence there are many societies and clubs with complex organizations which occupy the time and energy of many individuals. It is fitting, therefore, that what may appear to be a further organization be examined carefully to make sure that it has a clearly defined purpose and chance for success.

The maintenance and development of our civilization depends on science and its workers. Our great public questions will eventually be answered by the contributions of scientists. Now they may be made the basis of political arguments or solution may be sought by public opinion at the polls. An important need is, therefore, greater public understanding of the workaday use of science and a deeper public appreciation of the part that the scientific method plays in bringing the laboratory marvels of yesterday to be the tools of the unskilled tomorrow. Sigma Xi with its picked group of men and women working in all fields of science, can do much to accomplish tangible results in this vital field of general education.

A second purpose, of equal if not greater importance than the first, is the support and encouragement of research workers. Many of the 14,000 alumni have drifted away from the laboratory in which they won their first laurels that entitled them to membership but they have an intense loyalty to science and research. They understand its importance and they are seeking an opportunity to support and encourage its workers.

Success is limited only by the vision and capacity of its leadership. The natural enthusiasm of the picked group who have had no contact with the Society since they received the keys they wear so proudly will respond to any call to service. This has been proven by the fact that, of 4500 alumni to whom requests were addressed for assistance for the support of research under the auspices of the Society 3000 replies were received and many expressed great pleasure at the opportunity. Of the 1500 who did not reply, there is no way of knowing how many received the communication, as the address records are not complete or accurate. This interest and enthusiasm was further corroborated at the dinner of alumni held in New York in November (reported in the December 1924 *QUARTERLY*).

As intimated before, the task of changing 14,000 inactive alumni into active interested individuals is not easy. The first difficulty is administrative and consists in securing correct addresses. Money has been appropriated and the efficient Secretary of the Society is proceeding rapidly with the work. The next step is to secure and hold the interest of the individuals. On the theory that a person is interested in something for which he or she spends money, each alumnus will be asked for an annual contribution, the major portion of which will be spent directly for research under the guidance of a Fellowship Committee. The *QUARTERLY* will be sent to each contributor that there may be frequent contact with the Society. Further steps are under consideration. In general they will consist of the organization of groups of local alumni to promote intercourse between the several branches of science and to develop local projects of research support and encouragement. The keynote is simplicity of organization and clarity of purpose. In these lie success.

C. E. DAVIES, *Chairman.*  
Alumni Committee

December 30, 1924

# CHAPTER OFFICERS

LIST FURNISHED BY THE CORRESPONDING SECRETARIES OF THE CHAPTERS

CHAPTER	PRESIDENT	VICE-PRES.	SECRETARY	TREASURER
Cornell.....	A. H. Wright	S. L. Boothroyd	H. E. Howe...	C. C. Murdock
Rensselaer....	A. W. Davison..	L. W. Clark....	E. M. Clark....	W. J. Williams
Union.....	F. P. McKibben..	J. W. Mavor....	C. B. Hurd....	C. B. Hurd
Kansas.....	G. C. Shaad....	N. P. Sherwood..	G. W. Smith....	H. E. Jordan
Yale.....	H. S. Burr.....	C. R. Longwell..	S. R. Brinkley..	F. W. Keator, Jr.
Minnesota....	E. P. Lyon.....	F. F. Grant....	J. J. Willaman..	E. W. Davis
Nebraska....	W. L. Debaufre..	J. E. Weaver....	E. N. Andersen..	M. G. Gaba
Ohio.....	D. J. Demorest..	C. A. Wright....	C. H. Kennedy....	F. H. Eno
Pennsylvania..	H. C. Berry....	J. P. Moore....	J. R. Kline....	H. S. Colton
Brown.....	R. F. Chambers..	W. R. Burwell..	W. M. Faunce..	H. F. Davison
Iowa.....	L. C. Raiford....	A. O. Thomas....	Perry A. Bond..	F. A. Nagler
Stanford.....	H. F. Blichfeldt.	W. R. Miles....	E. W. Schultz..	E. W. Schultz
California....	Florian Cajori..	T. H. Goodspeed	T. D. Stewart..	A. C. Alvarez
Columbia....	A. W. Hixson...	C. P. Berkey....	S. L. Quimby....	S. L. Quimby
Chicago.....	H. C. Cowles....	H. H. Barrows..	E. R. Long....	E. R. Long
Michigan.....	A. S. Warthin...	E. M. Bragg....	J. H. Ehlers....	W. C. Rufus
Illinois.....	H. J. VanCleave	J. W. Lloyd....	W. H. Rayner..	J. M. Stetson
Case.....	J. J. Nassau....	R. D. Husley....	F. L. Plummer..	T. M. Focke
Indiana.....	O. W. Brown....	S. S. Visser....	H. T. Briscoe..	Paul Harmon
Missouri.....	A. C. Lanier....	G. W. Tann- reuther	W. A. Albrecht	W. A. Albrecht
Colorado.....	W. C. Hunting- ton	F. E. E. Ger- mann	C. F. Poe.....	F. S. Bauer
Northwestern.	T. F. Holgate..	W. V. Evans....	C. E. Tharald- sen	Margaret B. Fuller
Syracuse.....	L. E. Wise....	C. L. Brightman	V. Obreshkove..	O. Gelormini
Wisconsin....	A. S. Pearse....	E. M. Terry....	E. Truog.....	R. H. Dennison
University of Washington	R. M. Winger..	H. V. Tartar...	E. J. Saunders..	E. A. Loew
Worcester....	S. J. Plimpton..	Harris Rice....	C. D. Knight....	G. H. MacCul- lough
Purdue.....	R. A. Craig....	Wm Marshall..	A. P. Poorman..	C. M. Smith
Washington University	F. B. Hanson...	L. DeCady....	G. W. Lamke...	C. F. Hagenow
District of Columbia....	W. T. Lee....	E. C. Crittenden	A. E. Eckhardt..	M. A. Griffith
Texas.....	E. H. Sellards..	C. T. Gray....	O. B. Williams..	A. A. Bennett
Mayo Foun- dation.....	Louis B. Wilson	H. H. Bowling..	T. B. Magath..	T. B. Magath
N. Carolina...	J. M. Bell.....	R. E. Coker.....	Thorndike Sa- ville	Thorndike Sa- ville
N. Dakota....	H. J. Humpstone	J. G. Sinclair..	L. P. Dove....	L. P. Dove
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